

The answer to this question is not easy. Someone interested in being politically correct (and we are not) would say “anywhere that there is someone who knows how to do it.” We must rectify this misconception immediately. The ideal place to apply NIV depends almost entirely on the timing of its use. Figure 17.1 is an attempted diagram of the indications for NIV and places in which to apply it.

Our diagram does not, of course, take into account the true local conditions, the real doctor/patient ratio and, more importantly, the nurse/patient ratio, the monitoring system available, and the experience acquired by the team over time.

There are diseases for which patients are now almost never admitted to an intensive care unit, such as pulmonary edema and mild exacerbations of COPD, because these usually respond so well that they can be treated outside protected environments; the former case can even be treated directly in the patient’s home or in an ambulance.

Then there are particular conditions, such as the immunocompromised patient, in which it is better to avoid admission to an environment at high risk of infections, or terminal care, in which the NIV has only a palliative purpose and the patient and his relatives need privacy that is unlikely to be possible in an intensive care setting.

Besides experience with NIV, what makes the great difference between the various settings in which NIV is used is the monitoring system and the number of staff. In France, respiratory intensive care units or subintensive care units are classified into levels depending on the system of monitoring available; a similar strategy is also being attempted in Italy in accordance with the guidelines from the Italian Association of Hospital Pneumologists (AIPO); a patient may only be ventilated non invasively if a minimum set of instruments is available. In an English study of a few years ago, it was calculated that the annual prevalence of patients requiring NIV in a typical hospital in the United Kingdom is 75/100,000 among men and 57/100,000 among women. According to the authors, this means that each district general hospital should have a service dedicated specifically to NIV.

Openness to the world of NIV does not necessarily mean that the doctor must know how to intubate, as if this was the only limit to consider, but rather that he is

able to manage the preceding stages skillfully (the famous barrier of how far to persist with NIV) and any stages after intubation (application of invasive ventilation and any treatment of its consequences). In the case that the ideal structure does not exist, which is the situation in the majority of cases, it is to be hoped that the doctor, whatever his qualification (pneumologist, internist), can obtain help in real time from a colleague specialized in reanimation. For this reason, it is at least theoretically logical that NIV is administered in an area close to an intensive care unit.

In most cases the ideal place in which a patient should be treated is a respiratory intensive care unit, a subintensive care unit or a 'step-down' unit, however you wish to call it. Documents from AIPO and the European Respiratory Society (ERS) define three standards of respiratory intensive care unit based primarily on the monitoring, the type of ventilation possible besides NIV, the qualifications of the staff, the possibility of carrying out invasive procedures and perhaps physiotherapy. This has already been discussed and will be examined again in the chapter on monitoring, but we want to list here the structural features of a respiratory intensive care unit.

First of all, the structure and location of these units must take into account the pre-established purposes, which are ventilation therapy, non invasive monitoring, and free access to physiotherapists and relatives. A respiratory intensive care unit must be architectonically different from a traditional pneumology ward in that the access should be controlled and independent and have a minimum total area about three times greater than that of the body surface area of each, individual patient.

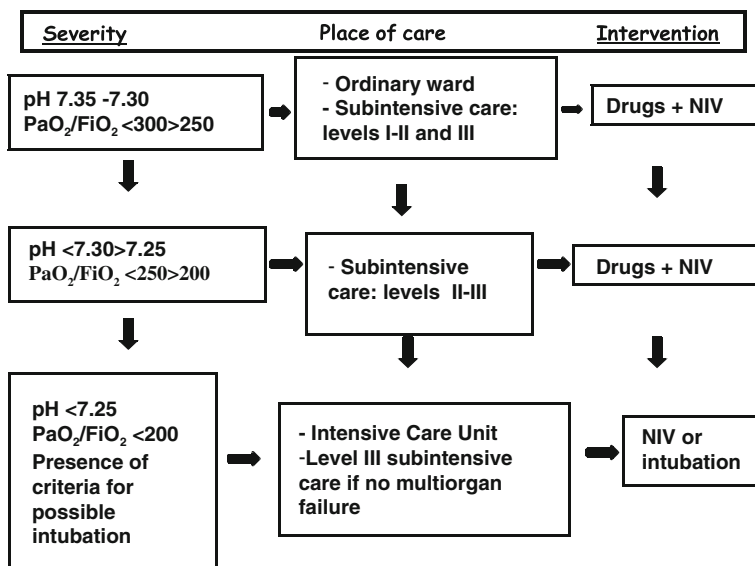


Fig. 17.1 Flow-chart of the use of NIV in hospital

The distinction from a traditional intensive care unit lies in the fact that the intensive respiratory care unit has a so-called open arrangement, which, while essentially retaining the same aseptic characteristics, enables controlled entry of the relatives directly involved in the rehabilitation programs. The main disadvantages of this type of structure are the lack of privacy and a potential increased risk of cross-infections, although this latter has not been demonstrated to be the case.

The ideal number of beds for this structure was stated by the AIPO in their guidelines on respiratory intensive care units to be 4–6 beds for a hospital with a capacity for more than 500 patients and 8 beds for a hospital with a capacity for more than 1,000 patients, or 1–2 beds for every 100,000 inhabitants. In the ideal structure, the area per patient should be 28 m² for a single room and 25 m² for shared rooms, including the space required for paramedical purposes and relatives' needs. In the case of a shared room, the bathroom must be spacious and have a so-called ante-room with sanitary installations including a bath for the handicapped. The access to the respiratory intensive care unit must allow easy passage of a bed and all the mobile equipment and instruments necessary, such as a portable X-ray machine, dialysis, and an echocardiograph.

The single or isolation rooms, usually reserved for immunocompromised patients, should have an ante-room of about 2.5 m² to allow visitors to wash their hands and put on a gown.

The structure behind and to either side of each bed should provide electricity sockets, compressed air, oxygen, a vacuum (for aspiration), and shelves where the ventilators and monitoring equipment can be placed; these should be articulated and suspended to enable rational positioning depending on the space needed for the medical and paramedical procedures. It is useful to provide space for at least two people behind the bed in order to enable help in the case of intubation, introduction of a central venous catheter, or resuscitation procedures. The bed should be mobile, with adjustable angulation controlled electronically and it should be possible to remove the bedhead.

A generator should be able to supply electricity automatically if a loss of current lasts for more than 5s. As far as concerns the gases and heating system, it is worth standardizing some parameters, such as:

- vacuum: negative pressure of 500 mmHg, with a constant flow of 40 L/m;
- oxygen: pressure of 5 bar, which should remain constant when the flow is 20 L/m at each output with all the outputs in use;
- compressed air: pressure of 5 bar, which should remain constant when the flow is 20 L/m at each output with all the outputs in use;
- ventilation: air filtered at 99 % for particles of a diameter of 5 mm; air-conditioning system with a relative humidity of 30–50 %;
- heating: 18–27 °C.

Each respiratory intensive care unit should include an operational center for nurses, with individual monitoring, and be equipped with a telephone, storage of disposable supplies for first aid, a defibrillator, and a small pharmacy.

Table 17.1 Factors to consider when deciding “where to ventilate”

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- Severity of the patient’s condition

 - Type of monitoring

 - Patient/nurse ratio

 - “Weaning test” (i.e., in how much time a patient’s clinical state and blood gases deteriorate once the interface has been removed)

 - The patient’s capacity and possibility to ask for help in the case of an emergency

 - The clinical staff’s experience and skill in administering NIV

 - Types of ventilator and oxygen sources available (i.e., high vs. low flow O₂)

 - Numbers, sizes, and types of interfaces available

 - Proximity to the intensive care unit

The storage space for the supplies must be easily reached by the medical and paramedical staff and there must be a “satellite” pharmacy, a refrigerator for storing blood samples, and equipment for emergencies.

In brief, when we are going to ventilate a patient non invasively, we must always ask ourselves a few simple questions and answer honestly, considering our limitations and our skills. Table 17.1 could be some help in this sense.

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